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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/804,677	03/12/2001	Todd C. Mowry	19427-004930US	2643

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EXAMINER

PORTKA, GARY J

ART UNIT	PAPER NUMBER
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2187

DATE MAILED: 07/16/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.
09/804,677

Applicant(s)
Mowry

Examiner
Gary J. Portka

Art Unit
2187



-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136 (a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on Mar 12, 2001.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11; 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 20-31 is/are pending in the application.
- 4a) Of the above, claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 20-31 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claims _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on May 18, 2001 is/are a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgement is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
*See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. § 119(e).
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☒ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892) 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s). 4 6) ☐ Other:

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DETAILED ACTION

1. The Office acknowledges receipt of the following:
 - a. Preliminary amendment, dated March 12, 2001.
 - b. Executed declaration, dated May 18, 2001.
 - c. Preliminary amendment, dated November 1, 2001.
2. Claims 20-31 are presented for examination.

Information Disclosure Statement

3. The information disclosure submitted May 18, 2001 (paper no. 4) was considered.

Specification

4. Applicant is requested to update Application numbers and status of co-pending applications listed at page 1.
5. Applicant's cooperation is requested in correcting any errors of which applicant may become aware in the specification.

Claim Rejections - 35 USC § 103

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

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7. Claims 20-21 and 26-27 are rejected under 35 U.S.C. 103(a) as being unpatentable over Baum et al., U.S. Patent 4,928,239, in view of DeLano et al., U.S. Patent 5,396,604.

8. As to claims 20-21 and 26-27, Baum substantially discloses the recited method including issuing an instruction with address fields and a hint field (see Figure 3), forming an address to access the cache (from elements 35' and 31', Figure 3), and prefetching the data when unavailable in the cache, in accordance with the hint field, which indicates expected use and a destination (see Abstract, column 3 lines 51-56, column 5 lines 28-42, and column 6 lines 34-43; "type of data" gives the expected use, and destination is indicated to the extent recited since the cache control specifier controls the replacement scheme, the replaced data item being the destination, additionally, the prefetch specifier additionally indicates a next block to load or store, and thus the cache destination).

Baum does not explicitly teach that the address fields consist of base and index or base and offset fields. Baum describes the fields as tag and index, which are used conventionally in cache accessing, but do not take into account virtual addressing. However, the use of virtual addressing was notoriously well known in the art. DeLano shows an analogous cache prefetch instruction where in order to provide virtual addressing, base and offset fields are included in the instruction (see column 3 line 60 to column 4 line 28, and Table 2). An artisan would have desired the well known advantages of providing efficient memory utilization for multiple programs (made possible by virtual addressing) to include the use of base and offset fields so as to implement virtual addressing in the system of Baum. Thus it would have been obvious to one of ordinary skill in the art at the time of

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the invention to include base, index, and offset fields, because these were known means of implementing virtual addressing for cache accessing.

9. Claims 22-25 and 28-31 are rejected under 35 U.S.C. 103(a) as being unpatentable over Baum et al., U.S. Patent 4,928,239, in view of DeLano et al., U.S. Patent 5,396,604, and further in view of Chi, U.S. Patent 5,822,757.

10. As to claims 22-25 and 28-31, Baum teaches that the hint indicates expected data reuse since the NORMAL, STACK, SEQUENTIAL, and PREFETCH data each have known reuse patterns. Baum also teaches set associative cache with ways (Figure 2), but neither Baum nor DeLano teach that the hint directs data to a certain way. However, Chi teaches an analogous prefetching system for a cache in which data having temporal locality (expected to be reused extensively) is kept separate from data having spatial locality (expected not to be reused extensively). An artisan would have recognized that the partitioning of the references taught by Chi would advantageously to the Baum system since it already has indications of expected data reuse. Further, it is clear that the easiest method of forming the partitioning in Baum would be to use the already existing partitions defined by the ways of the set associative cache shown in Figure 2. Thus in the combination of the teaching of Chi (to separate different expected reuse data in the cache) as applied to Baum would result in the hints directing the data to a certain way as claimed. As taught by Chi, the separation of the types of references improves the hit ratio and performance of the cache (see Chi Abstract, column 2 lines 60-64, column 3 lines 15-35 and 45-56, and column 4 line 66 to column 5 line 10), thus motivating an artisan to implement the teaching in the system of Baum. Thus it would have been obvious to one

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of ordinary skill in the art at the time of the invention to use the hints to direct data to a certain way, because the cache is already partitioned into ways, and the separation of different data types into different partitions of a cache improves performance.

Conclusion

11. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

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5,933,860 Instruction hint for predicting cache way to improve stream transitioning.

5,784,711 Data prefetching using decoded prefetched instructions.

3,898,624 Dynamically variable prefetch algorithm depending upon program type.

12. A shortened statutory period for response to this action is set to expire 3 (three) months and 0 (zero) days from the mail date of this letter. Failure to respond within the period for response will result in Abandonment of the application (see 35 USC 133, MPEP 710.02, 710.02(b)).

13. Any inquiry concerning this communication from the examiner should be directed to Gary J. Portka at telephone number (703) 305-4033. The examiner can normally be reached on weekdays from 9:00 A.M. to 5:30 P.M.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Do Yoo, can be reached at (703) 308-4908.

Any response to this action should be mailed to (or faxed as provided below):

Commissioner of Patents and Trademarks
Washington, D.C. 20231

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Hand-delivered responses should be brought to Crystal Park II, 2121 Crystal Drive, Arlington, VA., Fourth Floor (Receptionist).

The fax phone number for the organization where this application or proceeding is assigned are as follows:

(703) 746-7238 (After Final communications)

(703) 746-7239 (Official communications)

(703) 746-7240 (Status inquiries, draft communications)

Any inquiry of a general nature relating to this application or proceeding should be directed to the Group receptionist, whose telephone number is (703) 305-3900.

Gary J. Portka



Patent Examiner

July 10, 2002